Breaking barriers in resolution

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As Extreme ultraviolet lithography (EUVL) progresses in the commercialization phase, industry activities are being focused on near term concerns. The question of the extendibility of EUVL, however, remains crucial given the magnitude of the investments yet required to make EUVL a reality. The questions of extendibility are best addressed using advanced research tools such as the SEMATECH Berkeley microfield exposure tool (MET) and actinic inspection tool (AIT). Utilizing Lawrence Berkeley National Laboratory's Advanced Light Source facility as the light source, these tools benefit from the unique properties of synchrotron light enabling research at nodes generations ahead of what is possible with commercial tools.

The MET for example uses extremely bright undulator radiation to enable a lossless fully programmable coherence illuminator. Using such a system, resolution enhancing illuminations achieving k_1 factors of 0.25 can readily be attained. Given the MET numerical aperture of 0.3, this translates to an ultimate resolution capability of 12 nm.

A potential problem for advanced resist testing is also the availability of suitable masks. The MET illumination system can also address this concern through the implementation of a process we refer to as pseudo phase shift mask which allows a conventional binary amplitude mask to behave as a chromeless phase shift mask enabling pitch splitting. With this process, 12-nm resolution can be achieved with 24-nm coded features on the mask. Given the MET magnification of 5x, this translates to 120-nm features on the mask.

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